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HARNESS, DICKEY & PIERCE, P.L.C.			AWAI, ALEXANDRA F	
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RESTON, VA 20195			3663	
SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE		
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/748,174	TROSMAN ET AL.
Examiner	Art Unit	
Alexandra Awai	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1)  Responsive to communication(s) filed on 28 September 2006.
- 2a)  This action is FINAL.                            2b)  This action is non-final.
- 3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4)  Claim(s) 24,26-29 and 31-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5)  Claim(s) \_\_\_\_\_ is/are allowed.
- 6)  Claim(s) 24,26-29 and 31-33 is/are rejected.
- 7)  Claim(s) \_\_\_\_\_ is/are objected to.
- 8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9)  The specification is objected to by the Examiner.
- 10)  The drawing(s) filed on \_\_\_\_\_ is/are: a)  accepted or b)  objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a)  All    b)  Some \* c)  None of:
  1.  Certified copies of the priority documents have been received.
  2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)	5) <input type="checkbox"/> Notice of Informal Patent Application
Paper No(s)/Mail Date _____	6) <input type="checkbox"/> Other: _____

**DETAILED ACTION**

1. In view of the Appeal Brief filed on 9/28/2006, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

Jack Keith, *JACK KEITH*  
*SUPERVISORY PATENT EXAMINER*

*Status of the Claims*

2. In the Appeal Brief filed on 9/28/2006, the rejection of claims 24, 26-29 and 31-33 was appealed. The grounds of rejection relating to claims 24 and 26-29 are largely maintained – i.e., some unnecessary statement have been removed. However, it has become clear that the subject matter recited in claims 31-33 was never properly addressed. Claims 31-33 are drawn to the non-

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elected embodiment, II (Restriction/Election Requirement dated 7/16/2004). Due to an inadvertent oversight, the previous rejection indicated that claims 31-33 were rejected rather than withdrawn from further consideration under 37 CFR 1.142(b). Although the rejection of the previous Office Action dealt only with the subject matter of the elected embodiment, the non-elected embodiment remains patentably indistinguishable from the cited prior art.

Claims 24, 26-29 and 31-33 are currently pending and have been examined.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 24 and 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orii et al., and further in view of Ueda et al. and Johansson et al.

Orii et al. teach a structure that encompasses the basic inventive concept of the current application, i.e., a fuel bundle having water passages with circular or square cross-sections located either centrally or proximal to the center. In particular, Fig. 15 is identical to the elected embodiment that is described by the claimed (claims 24 and 28) features except that the rod subsets in a mirror-image long the center line between the two water passages are pairs rather than triplets. That is, Fig. 15 shows the following features of a fuel bundle for a boiling water reactor:

- a generally square, hollow tube having four sides which are configures as sides of the bundle,
- a pair of water passages located adjacent to a longitudinal centerline of the tube so as to extend centrally through the tube, the pair of water passages supported by one or more rod supports,
- a first part-length rod group including two part-length fuel rod subsets in a mirror-image along the centerline between the two-water passages, each subset further comprising two part-length fuel rods,
- a second part-length rod group including four pair of part-length rods, each part-length rod pair centrally located in the outermost row or column of the 10x10 matrix adjacent a corresponding one of the four sides of the tube.

Fig. 15 depicts a fuel bundle having twelve part-length fuel rods. The deficiency of Orii et al. is clearly acknowledged above, and there is no suggestion in the appealed rejection that Orii et al. anticipate the claimed fuel bundle.

Ueda et al. show that it is a well-known and advantageous expedient in the art to provide certain groupings of part-length rods, particularly a 3-rod subgroup adjacent to a water passage (39) (see Fig. 19; col. 12, lines 53-66). Applicant has not shown how the 3-rod group is functionally distinct from the 2-rod group such that it is *not* an obvious variant. As such, the inclusion of a third rod is no more than the duplication of parts with predictable and intended effects. See *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). Part-length rods serve to

ensure the maintenance of the reactor shut-down margin, and having a 3-rod grouping modulates this effect in a predictable fashion. In other words, there is no unexpected result that directly depends on the specifically claimed configuration. Therefore, the skilled artisan desiring to duplicate the effect of one of the rods in a 2-rod subset in the interest of modulating the shut-down margin would be motivated to provide a 3-rod subset. Making this obvious modification would inevitably result in adding two part-length fuel rods to the original twelve, resulting in fourteen part-length fuel rods (claim 27).

Ueda et al. disclose a plurality of voids formed above the upper ends of the shorter, or part-length, fuel rods (Fig. 25A) (claims 26, 29 and 32). Moreover, it is inherent to fuel bundles including part-length rods that there would be voids at the end of the shorter rods. Claims 26 and 29 are essentially reciting the absence of the portion of part-length rods that distinguishes them from full-length rods. The “void” feature is therefore structurally equivalent to the “part-length rods” feature, the object of which is to improve shutdown. As to limitations which are considered to be inherent in a reference, note the case law of *In re Ludtke*, 169 U.S.P.Q 563; *In re Swinehart*, 169 U.S.P.Q. 226; *In re Fitzgerald*, 205 U.S.P.Q 594; *In re Best et al.*, 195 U.S.P.Q. 430; and *In re Brown*, 173 U.S.P.Q. 685, 688.

Johansson et al. teach that the addition of part length rods lowers the pressure drop, thereby improving critical power. Note that reactor “shutdown” refers to the state of the reactor when it is subcritical (not producing sufficient neutrons to sustain fission chain reactions) by at least a margin defined in the reactor’s technical specifications – i.e., “shutdown margin” is understood in the nuclear art to be a metric of criticality and power. Some particularly relevant teachings of Johansson et al. include the following:

"Numerous advantages result from the part length rod construction. Improved cold shut down margin enables fuel to be designed with reduced amounts of burnable absorbers such as gadolinium. The tendency of the fuel bundle in the reactor to produce plutonium at the top of the bundle from resonance neutron capture in uranium 238 is reduced. The void overlying the part length rod has an increased vapor fraction with the result that the full length rods adjacent the voids have an increased liquid fraction. Further, the pressure drop in the upper two phase region of the fuel bundle is reduced. This being the case, the fuel bundle enjoys increased stability from thermal hydraulic and nuclear instabilities" (col. 2, lines 3-15).

The number and arrangement of part-length rods is therefore a matter of optimization within prior art conditions or through routine experimentation (See MPEP § 2144.05 II.A). The concept of including part-length rods in a fuel assembly in order to modulate shutdown is well-known (Ueda et al. column 12, line 65), and an optimization of a presently disclosed device is not considered patentably distinct from the original device.

It would have been obvious to one skilled in the art at the time of the invention to combine the aforementioned teachings – e.g., by placing the 3-rod group taught by Ueda et al. in the configuration taught by Orii et al., and applying the power modulation teachings provided by Johansson et al. – in order to provide the benefits that are the disclosed objects of all of the referenced prior art, particularly an improved shutdown margin, as part of an optimization of a known technology.

6. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orii et al. and Johansson et al.

Orii et al. teach a structure that encompasses the basic inventive concept of the current application, i.e., a fuel bundle having water passages with circular or square cross-sections located either centrally or proximal to the center. In particular, Fig. 20 shows the following features of a fuel bundle for a boiling water reactor:

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- a single, square-shaped water passage located off-center within a 10X10 fuel-rod matrix bounded by four sides of a generally square, hollow tube, the fuel rods including full-length and part-length fuel rods,
- a first rod group comprising two pairs of part-length rods arranged on either side of a corner of the square water passage; and a second rod group comprising two pairs of part-length rods,
- wherein each of the two pairs of part-length rods is located in a corresponding outermost row or column of the matrix adjacent a corresponding side of the tube.

Fig. 20 depicts an additional two pairs of part-length rods rather than two non-paired part-length rods as recited in claim 31. This prior art embodiment comprises a total of twelve part-length rods.

With regard to the void feature of claim 32, it is inherent to fuel bundles including part-length rods that there would be voids at the end of the shorter rods. Claim 32 is essentially reciting the absence of the portion of part-length rods that distinguishes them from full-length rods. The “void” feature is therefore structurally equivalent to the “part-length rods” feature, the object of which is to improve shutdown. As to limitations which are considered to be inherent in a reference, note the case law of *In re Luditke*, 169 U.S.P.Q 563; *In re Swinehart*, 169 U.S.P.Q. 226; *In re Fitzgerald*, 205 U.S.P.Q 594; *In re Best et al.*, 195 U.S.P.Q. 430; and *In re Brown*, 173 U.S.P.Q. 685, 688.

Johansson et al. teach that the addition of part length rods lowers the pressure drop, thereby improving critical power as set forth in section 5 above. The number and arrangement of part-length rods is therefore likewise a matter of optimization within prior art conditions or through routine experimentation (See MPEP § 2144.05 II.A). It would have been obvious to one of ordinary skill in the art at the time of invention to modify the arrangement of part-length rods depicted in Fig. 20 of Orii et al. to have either two (claim 31) or three (claim 33) non-paired rods as part of an optimization of a known technology. The beneficial effects of using part-length rods

are known and predictable, and the skilled artisan would be motivated to optimize these effects by producing part-length rod arrangements tailored to the neutronic environment in any given part of the reactor core. Moreover, making the aforementioned additional pairs of part-length rods into non-paired rods is no more than the omission of an element and its function where the element is not desired. *In re Larson*, 340 F.2d 965, 144 USPQ 347 (CCPA 1965). This modification would result in an embodiment that encompassed every feature of claim 31.

### ***Response to Arguments***

#### 7. Response to VII.A.

In section VII.A. of the appeal brief, Appellant submits that Orii et al., singly or in combination with Ueda, fail to teach or suggest the claimed fuel bundle for a boiling water reactor. ***Mention of Johansson et al. is conspicuously absent.*** Appellant then specifically points out the deficiencies of Orii et al. (appeal brief, p. 6), which are freely admitted by Examiner, and mischaracterizes Examiner's reliance on Ueda et al. That is, Appellant falsely claims that Examiner alleged that it would be obvious to combine the ***four sub-bundle arrangement*** as interpreted from Fig. 19 of Ueda et al. There is no mention of such a combination in the appealed rejection. It is an incontrovertible fact that Ueda et al. teach using a 3-rod (triangular orientation) grouping of part-length rods, and positioning that grouping adjacent to a water channel. The embodiment (Fig. 19) characterized by these features attains effects for increasing effective multiplication factor at a high temperature of operation and reducing the effective multiplication factor at the low temperature operation period (i.e., large shutdown margin). Examiner is not

attempting to combine *every feature* of this embodiment with the primary reference, but rather has gleaned relevant teachings regarding the configuration and position of the 3-rod subgroup.

The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). One of ordinary skill in the art, understanding the scientific phenomena (i.e., shutdown margin as it relates to criticality) that advantageously accompany the configuration of part-length rods disclosed by Ueda et al., would be motivated to combine the teachings thereof with the disclosures by Orii et al. in order to modulate those scientific phenomena by producing a differently configured bundle. The modification resulting from this combination does not require complete rearrangement of the fuel bundle matrix disclosed in Orii et al. Rather, employing two 3-rod groups as opposed to two 2-rod groups requires only replacing two full length rods with two part-length rods. This modification is within the purview of the skilled artisan, and is encompassed by the teachings of the cited art.

While the referenced fuel bundles of Orii et al. and Ueda et al. are different, it is misleading to suggest that the differences between the fuel bundle structures of Orii et al. and Ueda et al. are so great that teachings derived from one embodiment are inapplicable to the other. As one can see from the numerous various embodiments pictured in both Orii et al. and Ueda et al., fuel bundles having various sizes, water channels and fuel rod arrangements are based on related technology and are universally subject to hydraulic and neutronic stimuli within the

reactor. These embodiments, though different, are all designed to improve performance of the core based on the same physical stresses and effects associated with boiling water reactors. The differences between them correspond to varying advantages and limitations, but the teachings that can be derived from those varying advantages and limitations are applicable to fuel bundles in general. If the various combinations *actually* set forth in the rejection – as opposed to those provided by Appellant's misinterpretations – *were* technically unfeasible, then the claimed invention would also be impossible.

Moreover, claims 24 and 26-29 stand rejected in view of Orii et al., Ueda et al. *and* *Johansson et al.* One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

8. Response to VII.A.1

Appellant's assertion that "Examiner ... provides no motivation for combining this embodiment [Ueda (Fig. 25A and 25B)] with Ueda Fig. 19 and Orii Fig. 15" (appeal brief, p. 8) is completely false. Although one might even argue that Orii et al. and Ueda et al. provide adequate teachings to both teach and motivate the hypothetical obvious embodiment set forth in the rejection, Examiner has particularly cited Johansson et al. because of the explicit teachings it provides regarding the benefits of part-length rods. Achieving and optimizing these benefits – that is, improving critical power – is a powerful motivator in the nuclear art. It is only Appellant's gross mischaracterization of the appealed rejection, that is, the aforementioned bodily incorporation of the secondary reference, which provides a basis for Appellant to argue that improving critical power is somehow not an applicable motivation.

Appellant attempts to argue that because it is a different embodiment (Figs. 25A-D) that explicitly shows voids, it is not technically feasible to apply these teachings to the hypothetical obvious embodiment postulated by Examiner. This attempt is once again characterized by bodily incorporation of the features of a secondary reference into the structure of the primary reference. Examiner is not suggesting, and it is not required, to completely alter the bundle arrangement taught by Orii et al. in order to provide it with voids. In fact, Examiner has stated that voids are an inherent feature, and moreover that they are clearly pictured in Ueda et al. The teaching that intermediate-length rods provide an advantage is applicable to nuclear fuel bundles in general, regardless of the number of fuel rods or the shape of the water passages.

Also in section VII.A.1 of the appeal brief, Applicant attempts to suggest that because the “primary” objects of the prior art are different, that the skilled artisan is incapable of immediately appreciating the benefits of combining their teachings. However, careful consideration of Appellant’s argument reveals several flaws. First, it is irrelevant which object is a “primary focus” of the reference. Examiner is entitled to cite any teaching that is provided by a reference, even where those teachings are supposedly peripheral to the central problem the patented invention deals with. Second, the objects of increasing fuel utilization (burn-up) without increasing pressure loss (Orii et al.) and maintaining shutdown margin or improving axial power distribution (Ueda et al.) are both closely related each other and to optimizing reactor power. An important purpose of a nuclear reactor is to produce power. The efficiency, reliability, longevity and capacity of the reactor are interrelated and dependent upon fuel utilization, power distribution and myriad other factors affected by fuel bundle structure. No single fuel bundle structure is superior in every conceivable respect to other fuel bundle structures, and bundles of

varying configurations are used in different regions of the core. Third, the burden Examiner is attempting to meet is not that by making the modifications hypothesized in the rejection, one would in fact achieve the alleged primary objects of the cited references. Rather, Examiner maintains that, based on the numerous advantages resulting from part-length rod construction, there is a reasonable expectation of success for achieving improved reactor function, particularly embodied by improved shutdown margin. Indeed, there is no evidence that the invention of the instant application in fact provides improvements in performance over the cited prior.

Appellant's statements regarding the destruction of the references are baseless speculation. Examiner did select Orii et al. using the claimed invention as a blueprint, and, after identifying a deficiency in the most appropriate art, proceeded to search the prior art for the missing elements. The deficiency was the absence of a 3-rod subset adjacent to a water channel. The fact that the configuration of the secondary reference is different is not evidence that the 3-rod subset found therein is not applicable to the primary reference.

#### 9. Response to VII.A.2

Much as Appellant charges in section VII.A.2 of the appeal brief, Examiner did search for a prior art fuel assembly using the claimed invention as a blueprint, and, after identifying deficiencies in the most appropriate art, proceeded to search the prior art for the missing elements. However, contrary to Appellant's assertions, Examiner has identified and discussed the specific evidence of motivation to combine, which are chiefly evident in the Johansson et al. reference Appellant has avoided properly addressing. Examiner does provide additional comments regarding the duplication of parts, but these do not negate the motivations provided by Johansson et al. Additionally, the fact that adding an additional part-length rod changes the

characteristics of shutdown margin (SDM) is not evidence that the duplication of parts is nonobvious. In fact, only if the SMD did *not* change after adding a part-length rod or changed in an aberrant way would there be evidence of unpredictable effects and a basis for challenging the obviousness of duplication of parts. Appellant has failed entirely to address the motivations that are actually provided in the appealed rejection. It is not clear what Appellant finds objectionable about the practice of searching for the deficiency of the primary reference (triangular orientation of part-length rods) in other available documents.

#### 10. Response to VII.A.3

In section VII.A.3 of the appeal brief Appellant again mischaracterizes the rejection by stating, “Examiner has not adequately supported the selection and combination of Orii and Ueda.” The motivations provided by Johansson et al. are an integral part of the rejection. These teachings regarding the benefits of part-length fuel rods, including that the improved shutdown margin they provide allows for even further benefits are fully applicable to the other references. As to explaining the motivations that are clearly set forth, Examiner judged it extraneous to actually give reasons why improving reactor shutdown margin is beneficial enough to motivate the skilled artisan to use widely available technology to achieve it. This judgment is based on disclosures in the present specification, including the following statements found in the “Related Art” section:

“The disadvantage of using 100% full-length fuel rods is that reactor shut-down margin is not optimized” (¶ [0004]),

“Shut-down margin is therefore a sufficient percentage of trapped neutrons compared to fissioned neutrons which prevents criticality. Shut-down margin is commonly enhanced by distributing a quantity of part-length fuel rods in each bundle” (¶ [0004]),

“The known configurations of part-length fuel rods in a fuel bundle therefore do not achieve optimum reactor critical power and/or shut-down margin” (¶ [0006]).

Clearly, it is commonly understood in the art and by Appellant that improving reactor critical power and shut-down margin are powerful motivators. *Additionally, these disclosures characterize the invention’s alleged contribution over the prior art as an optimization of the known strategy of using part-length fuel rods, just as argued in the rejection and supported by Johansson et al.*

It must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the appellant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). The motivations cited by Examiner are clearly set forth in the prior art, and are not solely gleaned from the instant application, where they are furthermore admitted as being known. Also, as stated above, the test for obviousness is not that the claimed invention must be expressly suggested in any one or all of the references. It is perfectly legitimate to search for individual teachings provided by secondary references to cure the deficiencies of the primary reference, as long as those teachings are technically applicable and there is a motivation to combine. Such is the case in the present invention.

On page 12 of the appeal brief, Appellant provides the *first* substantive comment regarding Johansson et al. It is the conclusory statement that, “Johansson’s teachings are not relevant to any motivation for combining the part-length rod arrangement in two of Ueda’s 4X4 sub-fuel assemblies in Fig. 19, with Orii’s 10X10 fuel assembly having two central circular

water channels." The reason provided for this erroneous conclusion is that "critical power is related to boiling transition during actual critical reactor operation, and not to shutdown margin." In view of the aforesaid definition of shutdown margin, this reason is nonsensical. *Critical reactor operation and shutdown margin are interrelated concepts* (see specification, ¶ [0006]). Shutdown margin is a metric of criticality and power defined by the reactor's technical specifications, and is relevant during actual critical reactor operation. As stated in Johansson et al., "Improved cold shut down margin enables fuel to be designed with reduced amounts of burnable absorbers" (col. 2, lines 4-6). Burnable absorbers affect neutron flux within the reactor, which in turn affects criticality and power. This is only one, non-limiting example of why it *is* clear to anyone skilled in the art how the teachings of Johansson et al. are relevant to Examiner's stated motivation.

11. Response to VII.B.

New grounds of rejection for claims 31-33 have been set forth.

12. Response to VII.C.

With regard to section VII.C of the appeal brief, Examiner fully admits that the features of claim 27 are not explicitly taught by any one of the references. Examiner's statement that the number of part length rods is a matter of optimization within prior art conditions or through routine experimentation *is not unsupported*. It is based in part on teachings provided by Johansson et al. and reproduced on page 5 of this Examiner Answer. Additionally, it should be clear that once the modification of Orii et al. using the teachings of Ueda et al. motivated by Johansson et al. – i.e., the use of two 3-rod subgroups rather than two 2-rod subgroups – is implemented, the hypothetical obvious embodiment would have 14 part-length rods. That is, an

additional two part-length rods will have been added to the original twelve seen in Fig. 15 of Orii et al. The hydraulic and neutronic phenomena that may be modulated by optimizing the number of the rods are therefore established as known.

***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexandra Awai whose telephone number is (571) 272-3079. The examiner can normally be reached on 9:30-6:00 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA  
December 13, 2006

JACK KEITH  
SUPERVISORY PATENT EXAMINER